

- as
2. (Amended) A method of indicating pH levels in an animal, the method comprising:
- a) obtaining measurements corresponding to a body temperature of the animal at periodic sampling intervals;
  - b) applying an algorithm to the measurements obtained from a) which algorithm cumulatively takes account of variations in body temperature over time; and
  - c) correlating the results of the algorithm with a pH standard.

3. (Amended) The method as claimed in claim 1 wherein ten or more measurements corresponding to body temperature are taken.

4. (Amended) The method as claimed in claim 1 wherein the measurements are taken for a predetermined time period.

5. (Unchanged) The method as claimed in claim 4 wherein the predetermined time period is at least 12 hours.

6. (Amended) The method as claimed in claim 4 wherein the predetermined time period extends up to 24 hours.

7. (Amended) The method as claimed in claim 1 wherein the algorithm is applied at a end of the predetermined time period.

8. (Unchanged) The method as claimed in claim 7, wherein b) further comprises:
- determining that animal's average mean temperature reading over the predetermined time period;
  - calculating the variance between each measurement taken under a) and the mean determined; and
  - adding all variances to obtain the cumulative temperature variance score.

9. (Amended) The method as claimed in claim 1 wherein the algorithm is applied progressively.

10. (Unchanged) The method as claimed in claim 9 wherein the algorithm is applied progressively as each measurement corresponding to body temperature is taken.

11. (Amended) The method as claimed in claim 9 wherein c) is conducted after each application of the algorithm.

12. (Amended) The method as claimed in claim 1 wherein c) comprises comparing the results of the algorithm to a predetermined threshold and further, in the event of the threshold being exceeded, providing an indication of the threshold being exceeded.

13. (Unchanged) The method as claimed in claim 12 further including setting the animal aside for a predetermined animal withholding period in the event of the threshold being exceeded.

14. (Amended) The method as claimed in claim 9 wherein a mean is calculated progressively as each measurement corresponding to temperature is taken.

15. (Amended) The method as claimed in claim 9 wherein the algorithm comprises:

where:

$t_{ear}$  is the instantaneous ear temperature;

$t_{ambient}$  is the instantaneous ambient air temperature;

$d$  is the difference between ear and ambient temperatures;

$fast$  is the fast-response filter element;

$slow$  is the slow response filter element;

$v$  is the integral of the difference between the two filter elements;

$c_1$  is the time constant of the fast filter;

$c_2$  is the time constant of the slow filter;

Time constants are such that  $c_1 > c_2$ ,  $0 < c_1 < 1$ ,  $0 < c_2 < 1$ ;

where initially:

$$n=1$$

$$d_0 = t_{ear} - t_{ambient}$$

$$fast_0 = d_0$$

$$slow_0 = d_0$$

$$v_0 = 0$$

and where at each sampling interval:

$$d_n = t_{ear} - t_{ambient}$$

$$fast_n = (1 - c_1) * fast_{n-1} + c_1 * d_n$$

$$slow_n = (1 - c_2) * slow_{n-1} + c_2 * d_n$$

then:  $v_n = v_{n-1} + (fast_n - slow_n)$ .

16. (Unchanged) The method as claimed in claim 2 wherein an indication of a pH level greater than 5.8 indicates meat of poor quality.

---

an 17. (Amended) The method as claimed in claim 1 wherein the measurements are taken on the outer part of the animal's body.

18. (Amended) The method as claimed in claim 17 wherein skin temperature measurements are taken and compensation is provided for at least ambient temperature or solar radiation.

---

19. (Unchanged) The method as claimed in claim 17 wherein measurements are taken in the ear canal of the animal.

FOUO 042001

20. (Amended) A method of providing an indication of stress levels in an animal, the method comprising:

- a) obtaining measurements corresponding to a body temperature of the animal at periodic sampling intervals;
- b) applying an algorithm to the measurements obtained from a) which algorithm cumulatively takes account of variations in body temperature over time; and
- c) comparing the results of the algorithm to a predetermined threshold.

21. (Amended) A method of providing an indication of stress levels in an animal, the method comprising:

- a) obtaining measurements corresponding to a body temperature of the animal at periodic sampling intervals;
- b) applying an algorithm to the measurements obtained from a) which algorithm cumulatively takes account of variations in body temperature over time; and
- c) correlating the results of the algorithm with a stress standard.

22. (Amended) The method as claimed in claim 20 wherein ten or more measurements corresponding to body temperature are taken.

23. (Amended) The method as claimed in claim 20 wherein the measurements are taken for a predetermined time period.

24. (Unchanged) The method as claimed in claim 23 wherein the predetermined time period is at least 12 hours.

25. (Amended) The method as claimed in claim 23 wherein the predetermined time period extends up to 24 hours.

a9 26. (Amended) The method as claimed in claim 20 wherein the algorithm is applied at the end of a predetermined time period.

---

27. (Unchanged) The method as claimed in claim 26, wherein b) further comprises:

a) determining that animal's mean body temperature reading over the predetermined time period;

b) calculating the variance between each measurement taken under a) and the mean determined; and

c) adding all variances to obtain the cumulative temperature variance score.

---

a10 28. (Amended) The method as claimed in claim 20 wherein the algorithm is applied progressively.

---

29. (Unchanged) The method as claimed in claim 28 wherein the algorithm is applied progressively as each measurement corresponding to body temperature is taken.

---

all 30. (Amended) The method as claimed in claim 28 wherein c) is conducted after each application of the algorithm.

---

31. (Amended) The method as claimed in claim 20 wherein c) comprises comparing the results of the algorithm to a predetermined threshold and further, in the event of the threshold being exceeded, providing an indication of the threshold being exceeded.

---

32. (Unchanged) The method as claimed in claim 31 further including setting the animal aside for at least a predetermined animal withholding period in the event of the threshold being exceeded.

---

an 33. (Amended) The method as claimed in claim 28 wherein a mean is calculated progressively as each measurement corresponding to temperature is taken.

---

34. (Amended) The method as claimed in claim 28 wherein the algorithm comprises:

where:

$t_{ear}$  is the instantaneous ear temperature;

$t_{ambient}$  is the instantaneous ambient air temperature;

$d$  is the difference between ear and ambient temperatures;

$fast$  is the fast-response filter element;

$slow$  is the slow response filter element;

$v$  is the integral of the difference between the two filter elements;

$c_1$  is the time constant of the fast filter;

$c_2$  is the time constant of the slow filter;

Time constants are such that  $c_1 > c_2$ ,  $0 < c_1 < 1$ ,  $0 < c_2 < 1$ ;

where initially:

$$n=1$$

$$d_0 = t_{ear} - t_{ambient}$$

$$fast_0 = d_0$$

$$slow_0 = d_0$$

$$v_0 = 0$$

and where at each sampling interval:

$$d_n = t_{ear} - t_{ambient}$$

$$fast_n = (1 - c_1) * fast_{n-1} + c_1 * d_n$$

$$slow_n = (1 - c_2) * slow_{n-1} + c_2 * d_n$$

then:  $v_n = v_{n-1} + (fast_n - slow_n)$ .

an 35. (Amended) The method as claimed in claim 20 wherein the measurements are taken on the outer part of the animal's body.

Amended 36. (Amended) The method as claimed in claim 35 wherein skin temperature measurements are taken and compensation is provided for at least ambient temperature or solar radiation.

---

37. (Unchanged) The method as claimed in claim 35 wherein measurements are taken in the ear canal of the animal.

---

A13 38. (Amended) A method of measuring stress levels in an animal, the method comprising measuring the animal's pH level using a method of claim 1, a pH level greater than 5.8 to 6.2 indicating a stressed animal.

05830145-042001



39. (Amended) A method of providing an indication of meat quality in an animal, the method comprising:

- a) obtaining measurements corresponding to a body temperature of the animal at periodic sampling intervals;
- b) applying an algorithm to the measurements obtained from a), which algorithm cumulatively takes account of variations in body temperature over time; and
- c) comparing the results of the algorithm to a predetermined threshold.

40. (Amended) A method of providing an indication of meat quality in an animal, the method comprising:

- a) obtaining measurements corresponding to a body temperature of the animal at periodic sampling intervals;
- b) applying an algorithm to the measurements obtained from a), which algorithm cumulatively takes account of variations in body temperature over time; and
- c) correlating the results of the algorithm with a meat tenderness standard.

41. (Amended) The method as claimed in claim 39 wherein ten or more measurements corresponding to body temperature are taken.

42. (Amended) The method as claimed in claim 39 wherein the measurements are taken for a predetermined time period.

43. (Unchanged) The method as claimed in claim 42 wherein the predetermined time period is at least 12 hours.

44. (Unchanged) The method as claimed in claim 42 wherein the predetermined time period extends up to 24 hours.

am 45. (Amended) The method as claimed in claim 39 wherein the algorithm is applied at a end of the predetermined time period.

46. (Unchanged) The method as claimed in claim 45, wherein b) further comprises:  
determining that animal's mean body temperature reading over the predetermined time period;  
calculating the variance between each measurement taken under a) and the mean determined; and  
adding all variances to obtain the cumulative temperature variance score.

a15 47. (Amended) The method as claimed in claim 39 wherein the algorithm is applied progressively.

48. (Unchanged) The method as claimed in claim 47 wherein the algorithm is applied progressively as each measurement corresponding to body temperature is taken.

a16 49. (Amended) The method as claimed in claim 47 wherein c) is conducted after each application of the algorithm.

50. (Amended) The method as claimed in claim 39 wherein c) comprises comparing the results of the algorithm to a predetermined threshold and further, in the event of the threshold being exceeded, providing an indication of the threshold being exceeded.

51. (Unchanged) The method as claimed in claim 50 further including setting the animal aside for a predetermined animal withholding period in the event of the threshold being exceeded.

a17 52. (Amended) The method as claimed in claim 47 wherein a mean is calculated progressively as each measurement corresponding to temperature is taken.

53. (Amended) The method as claimed in claim 47 wherein the algorithm comprises:

where:

$t_{ear}$  is the instantaneous ear temperature;

$t_{ambient}$  is the instantaneous ambient air temperature;

$d$  is the difference between ear and ambient temperatures;

$fast$  is the fast-response filter element;

$slow$  is the slow response filter element;

$v$  is the integral of the difference between the two filter elements;

$c_1$  is the time constant of the fast filter;

$c_2$  is the time constant of the slow filter;

Time constants are such that  $c_1 > c_2$ ,  $0 < c_1 < 1$ ,  $0 < c_2 < 1$ ;

where initially:

$$n=1$$

$$d_0 = t_{ear} - t_{ambient}$$

$$fast_0 = d_0$$

$$slow_0 = d_0$$

$$v_0 = 0$$

and where at each sampling interval:

$$d_n = t_{ear} - t_{ambient}$$

$$fast_n = (1 - c_1) * fast_{n-1} + c_1 * d_n$$

$$slow_n = (1 - c_2) * slow_{n-1} + c_2 * d_n$$

then:  $v_n = v_{n-1} + (fast_n - slow_n).$

all  
54. (Amended) The method as claimed in claim 39 wherein the measurements are  
taken on the outer part of the animal's body.

concl'd  
55. (Amended) The method as claimed in claim 54 wherein skin temperature  
measurements are taken and compensation is provided for at least ambient temperature or solar  
radiation.

---

56. (Unchanged) The method as claimed in claim 54 wherein measurements are taken in  
the ear canal of the animal.

TOO240-5470E850

57. (Amended) A system for providing an indication of meat quality in an animal to be slaughtered, the system comprising:

a body mountable measurement device for obtaining measurements corresponding to the body temperature of the animal at periodic sampling intervals over a period of between 3-36 hours; and

a processor having input means for receiving the measurements from the measurement device, the processor operable to implement an algorithm to the measurements, which algorithm cumulatively takes account of variations in body temperature over time, wherein the processor has output means for providing the result of the algorithm.

58. (Amended) The system as claimed in claim 57 wherein the algorithm comprises the following:

determine the animal's mean body temperature from the measurements;  
calculate the variance between each measurement and the mean; and  
add all variances to obtain a cumulative variance score.

59. (Amended) The system as claimed in claim 57 wherein the algorithm comprises the following:

where:

$t_{ear}$  is the instantaneous ear temperature;

$t_{ambient}$  is the *instantaneous* ambient air temperature;

$d$  is the *difference* between ear and ambient temperatures;

$fast$  is the *fast*-response filter element;

$slow$  is the *slow response* filter element;

$v$  is the integral of *the* difference between the two filter elements;

$c_1$  is the time *constant* of the fast filter;

$c_2$  is the time *constant* of the slow filter;

Time constants are such that  $c_1 > c_2$ ,  $0 < c_1 < 1$ ,  $0 < c_2 < 1$ ;

where initially:

$$n=1$$

$$d_0 = t_{ear} - t_{ambient}$$

$$fast_0 = d_0$$

$$slow_0 = d_0$$

$$v_0 = 0$$

and where at each sampling interval:

$$d_n = t_{ear} - t_{ambient}$$

$$fast_n = (1 - c_1) * fast_{n-1} + c_1 * d_n$$

$$slow_n = (1 - c_2) * slow_{n-1} + c_2 * d_n$$

then:  $v_n = v_{n-1} + (fast_n - slow_n)$ .

60. (Amended) The system as claimed in claim 57 wherein the system is embodied in an all-in-one indicator device.

61. (Unchanged) The system as claimed in claim 60 wherein the device is provided in the form of an ear tag.

62. (Unchanged) The system as claimed in claim 61 wherein the tag incorporates the measurement device.

63. (Amended) The system as claimed in claim 57, wherein the processor is provided by way of a remote computer.

64. (Amended) The system as claimed in claim 57 wherein the processor is adapted to output a numeric value from a comparison with a meat tenderness scale.

65. (Amended) The system as claimed in claim 57 wherein the processor is operable to compare the output of the algorithm to a predetermined threshold.

66. (Unchanged) The system as claimed in claim 65 further including an indicator to indicate where the output of the algorithm has exceeded the predetermined threshold.

67. (Unchanged) The system as claimed in claim 66 wherein the indicator is also operable to provide an indication that the system is functioning.

68. (Amended) A system for indicating cumulative stress in an animal, the system comprising:

a body mountable measurement device for obtaining measurements corresponding to outer body temperature of the animal at periodic time intervals over a period of between 3-6 hours; and

a processor having an input to receive measurements from the measurement device, the processor operable to implement an algorithm to the measurements, which algorithm cumulatively takes account of variations in body temperature over time, wherein the processor has an output for the result of the algorithm.

69. (Amended) The system as claimed in claim 68 wherein the algorithm comprises the following:

determine the animal's average body temperature from the measurements;  
calculate the variance between each measurement and the average; and  
add all variances to obtain a cumulative variance score.



70. (Amended) The system as claimed in claim 68 wherein the algorithm comprises the following:

where:

$t_{ear}$  is the instantaneous ear temperature;

$t_{ambient}$  is the instantaneous ambient air temperature;

$d$  is the difference between ear and ambient temperatures;

$fast$  is the fast-response filter element;

$slow$  is the slow response filter element;

$v$  is the integral of the difference between the two filter elements;

$c_1$  is the time constant of the fast filter;

$c_2$  is the time constant of the slow filter;

Time constants are such that  $c_1 > c_2$ ,  $0 < c_1 < 1$ ,  $0 < c_2 < 1$ ;

where initially:

$$n=1$$

$$d_0 = t_{ear} - t_{ambient}$$

$$fast_0 = d_0$$

$$slow_0 = d_0$$

$$v_0 = 0$$

and where at each sampling interval:

$$d_n = t_{ear} - t_{ambient}$$

$$fast_n = (1 - c_1) * fast_{n-1} + c_1 * d_n$$

$$slow_n = (1 - c_2) * slow_{n-1} + c_2 * d_n$$

then:  $v_n = v_{n-1} + (fast_n - slow_n)$ .

A20  
amended

71. (Amended) The system as claimed in claim 68 wherein the system is embodied in an all-in-one indicator device.

---

72. (Unchanged) The system as claimed in claim 71 wherein the device is provided in the form of an ear tag.

73. (Unchanged) The system as claimed in claim 72 wherein the tag incorporates the measurement device.

---

A21

74. (Amended) The system as claimed in claim 68 wherein the processor is provided by way of a remote computer.

75. (Amended) The system as claimed in claim 68 wherein the processor is adapted to output a numeric value or comparison with a meat tenderness scale.

76. (Amended) The system as claimed in claim 68 wherein the processor is operable to compare the output of the algorithm to a predetermined threshold.

---

77. (Unchanged) The system as claimed in claim 76 further including an indicator to indicate where the output of the algorithm has exceeded the predetermined threshold.

78. (Unchanged) The system as claimed in claim 77 wherein the indicator is operable to indicate that the system is functioning.

09830145-042001

79. (Amended) A system of indicating pH in an animal, the system comprising:  
a body mountable measurement device for obtaining measurements corresponding to  
outer body temperature of the animal at periodic time intervals over a period of between 3-6  
hours; and

a processor having an input to receive measurements from the measurement device,  
the processor operable to implement an algorithm to the measurements, which algorithm  
cumulatively takes account of variations in body temperature over time, wherein the  
processor has an output for the result of the algorithm.

80. (Amended) The system as claimed in claim 79 wherein the algorithm comprises:  
determine the animal's average body temperature from the measurements;  
calculate the variance between each measurement and the average; and  
add all variances to obtain a cumulative variance score.

81. (Amended) The system as claimed in claim 79 wherein the algorithm comprises:

where:

$t_{ear}$  be the instantaneous ear temperature;

$t_{ambient}$  be the instantaneous ambient air temperature;

$d$  is the difference between ear and ambient temperatures;

$fast$  is the fast-response filter element;

$slow$  is the slow response filter element;

$v$  is the integral of the difference between the two filter elements;

$c_1$  is the time constant of the fast filter;

$c_2$  is the time constant of the slow filter;

Time constants are such that  $c_1 > c_2$ ,  $0 < c_1 < 1$ ,  $0 < c_2 < 1$ ;

where initially:

$$n=1$$

$$d_0 = t_{ear} - t_{ambient}$$

$$fast_0 = d_0$$

$$slow_0 = d_0$$

$$v_0 = 0$$

and where at each sampling interval:

$$d_n = t_{ear} - t_{ambient}$$

$$fast_n = (1 - c_1) * fast_{n-1} + c_1 * d_n$$

$$slow_n = (1 - c_2) * slow_{n-1} + c_2 * d_n$$

then:  $v_n = v_{n-1} + (fast_n - slow_n)$ .

add  
could

82. (Amended) The system as claimed in claim 79 wherein the system is embodied in an all-in-one indicator device.

---

83. (Unchanged) The system as claimed in claim 82 wherein the device is provided in the form of an ear tag.

84. (Unchanged) The system as claimed in claim 83 wherein the tag incorporates the measurement device.

---

add  
09030145-042001

85. (Amended) The system as claimed in claim 79 wherein the processor is provided by way of a remote computer.

86. (Amended) The system as claimed in claim 79 wherein the processor is adapted to output a numeric value from a comparison with a meat tenderness scale.

87. (Amended) The system as claimed in claim 79 wherein the processor is operable to compare the output of the algorithm to a predetermined threshold.

---

88. (Unchanged) The system as claimed in claim 87 further including an indicator to indicate where the output of the algorithm has exceeded the predetermined threshold.

u24

one or more animal temperature sensors disposed on/in the attachment portion for contact with the animal during use.

s claimed in c

925

[illegible]

94. (Amended) The tag as claimed in claim 89 wherein the tag comprises a one piece molded body.